

THE  
AMERICAN MUSEUM  
JOURNAL

XII

NOVEMBER, 1912

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# American Museum of Natural History

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# The American Museum Journal

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MARY CYNTHIA DICKERSON, *Editor*

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A LIVING LUNGFISH—THE SECOND SPECIMEN EVER BROUGHT TO THE UNITED STATES

It came from Africa in a dry clod of earth from the bottom of a dried-up stream and is here shown fully recovered from its months of out-of-water existence. It is pale colored, sleek, its back fin with waxy bloom, its lateral fins delicate and straight (Compare with cut on page 251). The lungfish pictures the kind of fish which gave rise to land-living animals. It uses its fins in a fashion to suggest the legs of a salamander and has many striking structural similarities to a salamander



# The American Museum Journal

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No. 7



"Lady Lena" bigtree with room cut out and door fitted in the trunk. Diameter 21 feet, Sequoia National Forest, Tulare County, California

## PRESENT CONDITION OF THE CALIFORNIA BIGTREES<sup>1</sup>

*By George B. Sudworth*

[CHIEF OF DENDROLOGY, UNITED STATES FOREST SERVICE]

EVERYONE who has visited California's famous sequoias admits that their real grandeur and the reverence they inspire cannot be appreciated without standing in their presence. Comparisons with other trees fail utterly to give a correct impression of their gigantic size.

<sup>1</sup> The Museum's specimen of bigtree collected by special expedition to California some twenty years ago, has been recently moved from the Darwin hall to the west end of the forestry hall. Here it has been newly faced off and put again on exhibition with labels pointing out the centuries of growth from 550 A. D. to 1891 A. D. and relating the history of this growth to that of the development of the world's science and art.

Interest in the bigtree is peculiarly great at this time when wood and forest production are recognized paramount in importance to the American nation. Is there a future as well as a past for this tree from prehistoric times, which has the ability to attain a height of 300 feet and an age greater than that of any other living thing, and which has remarkable value whether destined for the timber market or permanently for the mountain side? Can young sequoia forests be made to rise on land bared of their giant forefathers by fire or lumbermen? The question has been a disputed one. Dr. Sudworth's article represents personal investigation in the various California groves. The photographs are by the author.—M. C. D.



OLD BURNED TRUNK OF CENTENNIAL EXPOSITION BIGTREE

This tree was cut in 1876 to gain a section for the centennial exposition. Interior view in Sequoia National Forest (photographed in 1900)

With the possible exception of a sister species, the Coast redwood, and some of the Australian eucalypts, the bigtree is unique among the world's living arborescent plant forms. While it lives in a land where pines and firs grow to enormous size and to great age, even the largest of the latter is small in comparison with the sequoia towering one hundred to one hundred and fifty feet higher, its trunk broader by twenty or more feet, and from two thousand to nearly three thousand years older.

The North Calaveras bigtree grove was the first one discovered (1841), and the renown of this tree in America and abroad probably came chiefly from accounts of the trees as seen there, although later from the Mariposa grove. Forty or more years ago botanists and a few explorers knew in a general way that the sequoia ranged from the North Calaveras grove southward in the Sierras to the Tule River country, but until quite recently we have had no published account of the exact location and extent of all of the existing "groves" and "forests." Singularly enough however, the locations of these trees, so long unknown to published literature, were familiar to the early back country settlers and lumbermen, and particularly



Log cuttings and broken, waste trunks on cut-over bigtree land near sawmill, Sequoia National Forest

to cattle and sheep men whose herds browsed beneath the giants even fifty or sixty years ago.

Passing over the question of whether or not the bigtree should be called *Sequoia gigantea*, *Sequoia wellingtoniana* or *Sequoia washingtoniana*, far



Bigtree 20 feet in diameter damaged by fire, Redwood Mountain Forest, Tulare County, California. Nearly every large sequoia in California is scarred by fire

more interesting matters are what exactly is the range of this ancient tree, and how is it holding its own in the struggle for existence with other trees of its range. Thirty-one large and small groups are now known. They are more or less widely separated from one another, extending on the north from a point in the Sierras near the southern boundary of Placer County

for one hundred and fifty miles as the crow flies, southward to the head of the south fork of Deer Creek (a tributary of White River) in Tulare County. The different groups contain from half a dozen to several thousand trees and cover from less than an acre of ground to ten square miles, aggregating



Looking along the trunk of a bigtree crushed in falling. Lumber operations, Fresno County. Recent cuttings of bigtrees are in the King's River and Kaweah River forests.

altogether about fifty square miles. They are mountain trees, growing naturally only at elevations from 5000 to 8500 feet.

Ownership of lands carrying bigtrees is variously divided between private individuals and the federal government, and with few exceptions all of the trees are within the national forests of California, where irrespective of ownership, the government guards them as much as possible against fire.





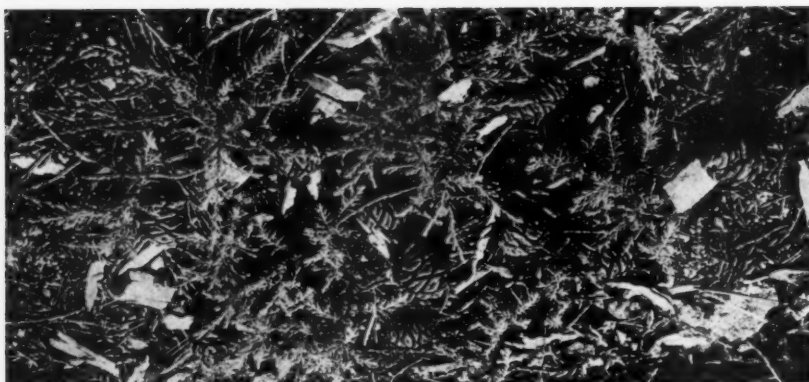
VIEW IN MARIPOSA GROVE

"General Grant," "General Sherman" and "Four Guards," Yosemite National Park, Mariposa  
County, California



BIGTREES IN CALAVERAS GROVE

"Mother of the Forest" in the background, a bigtree killed in 1854 by having the bark stripped from the trunk. It measures 84 feet in circumference at the base without this bark and stands more than 300 feet high. Stanislaus National Forest, Calaveras County, California



Seedling bigtrees two years old and two or three inches high. They are growing in moist soil where the surface has been cleared by fire. Sequoia National Forest

The bigtree lives more or less closely associated with the stately sugar pine and western yellow pine, the white fir and incense cedar, and at lower levels the California black oak, sugar pine and white fir are its more frequent neighbors. Pure stands of bigtrees occur in but few instances, the most notable of such stands being the Redwood Mountain and Giant forests, in which the solemn grandeur of this tree is most impressive.

None of the government's bigtrees are being cut, but privately owned holdings have been lumbered as far back as forty or fifty years ago, and the work is still going on. The lumbering of this timber has from the first been confined mainly to the southern groups. Recent cuttings are in the King's River (Converse Basin) and Kaweah River forests, while old work took place notably in the Redwood Mountain, Merced, and Tule River regions. The



Seedling bigtrees eleven or twelve years old and three and one-half feet high. There is abundant reproduction where old trees have been felled by fire and the surface soil bared. Sequoia National Forest

earlier cutting took only part of this timber, but the later operations have removed practically every tree.

Innumerable fires have scarred nearly every large bigtree. [Some have great holes eaten into their sides large enough to admit a horse and rider, but still live, while only blackened pits mark the places where others once stood. Doubtless very many more would have been destroyed, had not nature provided these trees with an enormously thick bark which has enabled large numbers to survive the fierce flames to which they have long been subjected.

A quite prevalent popular belief is that the bigtree is not reproducing itself, and that should the huge trees now standing be destroyed, the species might become extinct. This impression probably came from observations made in the northern groves where seedlings are very rare, the natural conclusion being that the species is in general reproducing itself only very occasionally or not at all. This supposed fact has been used as one of the arguments for the federal purchase of the North Calaveras grove, which is still in private hands. I believe that for other good reasons this splendid body of bigtrees should be owned and protected by the government, but not because the species is in danger of disappearing for lack of reproductive capacity.

A study of the silvical requirements of the bigtree shows that it is intolerant of shade, and that moreover unless the seeds fall on mineral soil — freed by fire or logging operations of its usual thick layer of half-rotted vegetable matter — the resulting seedlings perish long before the slender roots can force their way through the dry "duff" and into the soil below. Unlike the southern groves, the northern bigtree forests have had no lumbering operations in them to open up the dense shade and to tear the



Dense stand of young bigtrees four to thirty feet high. Sequoia National Forest. Under favorable soil and light conditions young bigtrees are holding their own in competition with other species

ground. As a result, there is practically no reproduction in the northern groves. By the most diligent search the writer found only one or two five-year-old bigtree seedlings in the South Calaveras grove; where storm had made an opening in the forest and a ground fire had exposed a little mineral soil. Apparently good use had been made of the first opportunity for reproduction, for the young bigtrees were vigorous in the full enjoyment of the sun.

Wherever in the southern groves lumbering and fire have opened up the forest and exposed the mineral earth, an abundance of young bigtrees is always found near seed trees, unless, of course, fire has destroyed them. The dependence of this tree for its reproduction on direct sunlight and open soil is particularly evident in the Tule River cañons where very open stands of large bigtrees have invariably seeded up the washed gravelly soil.

It is evident that under favorable soil and light conditions the bigtree is not lacking in reproductive energy, and that under these conditions it is holding its own in competition with other trees. Although it is but meagrely represented in the few scattered groups now preserved, the species seems still to possess that strong inherent reproductive power that permits survival of the fit.



Typical appearance of land near a sawmill where the bigtree forest has been cut. None of the government's bigtrees are being cut at present



## ZOOLOGY OF THE STEFÁNSSON-ANDERSON EXPEDITION — A PRELIMINARY ESTIMATE

*By J. A. Allen*

THE work of the Stefánsson-Anderson expedition in Arctic America is of great importance to zoölogy, much of the immense region traversed having never previously been visited by a collector and observer trained for natural history exploration. Dr. R. M. Anderson has been especially in charge of this work, and considering the difficulties of transportation and travel encountered, has made collections of great value, which with his field observations, covering a period of four and one-half years, must add greatly to our knowledge of the bird and mammal life of this hitherto very imperfectly known part of North America. The field covered includes the coast region of Alaska east of Colville River, and the Barren Grounds of the Yukon and Mackenzie districts east to Coronation Gulf. The collections, now en route to the Museum, include good series of all the Arctic breeding birds with their nests and eggs, and also of the mammals of the region, both small and large. The former comprise shrews, field mice, lemmings, spermophiles, porcupines and hares, while the fur-bearing and game animals include the ermine, martin, wolverine, white, blue, red, cross and silver foxes, wolves, seals, polar and barren ground bears, sheep and caribou. The last-mentioned is represented by a very large series of specimens from the Barren Grounds of Alaska and the Horton and Coppermine River regions, and will supply an important link in the chain of evidence bearing upon the morphology and geographical relations of the Arctic forms of this exceedingly interesting and plastic group of the deer tribe. The series of seventeen mountable skins of the barren ground bear, with their skulls and leg bones and two additional skulls, representing both sexes and all ages, is a most noteworthy acquisition. Although a bear allied to the grizzly and supposed to be possibly referable to it, has been known from this region for a century, and was formally named and introduced into science more than fifty years ago as a distinct species, it is still represented in museums by only a few skulls, its external characters having remained practically unknown, and nothing has been recorded of its life history.

While the collections of birds and mammals made by Dr. Anderson are very comprehensive in respect to both species and specimens and include much material of great scientific value, his field notes must prove an even greater contribution to our knowledge of the fauna of Arctic America.

## R. M. ANDERSON IN UNEXPLORED ARCTIC AMERICA

*[Editorial comment on the zoölogical work of the Stefánsson-Anderson Arctic expedition and quotations from Dr. Anderson's letters]*

THE zoölogical work of the Stefánsson-Anderson expedition brings to the American Museum the most complete and valuable zoölogical collection ever gathered together in the Arctic. It does this in spite of the fact that the expedition as a zoölogical enterprise has been working under a twofold handicap: First that its primary aim was not zoölogical and second that its method of exploration was the one chosen.

The main aim of the expedition was ethnological; that was understood in the original contract, paragraph 3 of that formal agreement reading as follows: "That the primary aim of the expedition is, as stated in paragraph 1, the scientific study of the Eskimo, and that the movements of the party are to be regulated accordingly." This put Dr. Anderson, the zoölogist of the expedition and second in command under Mr. Stefánsson, in a position in which he must sometimes yield his plans to the plans of the expedition as a whole.

That the method of exploration was satisfactory for the study of the Eskimo and less favorable for systematic zoölogical survey can also well be understood. The expedition carried few supplies and depended on getting a living from the country. This often necessitated much time spent in hard labor for a living and in moving at inopportune times to reach sources of food supply, all of which must have considerably interfered with intensive study of any given locality with the attendant collecting and preparation of material.

Add to these two handicaps the natural one of the country with its almost insurmountable obstacles to transportation of heavy equipment and collections, and some small part of Dr. Anderson's work will be realized. Four years of a man's life away from civilization, confronting each day problems of existence and travel in addition to the problems of a zoölogical survey, is much to give for the cause of science. We appreciate Dr. Anderson's words when in one of his letters he compares the attitude of the Eskimo of the expedition with that of the leaders, "If we get in touch with ships, a certain amount of provisions must be obtained to satisfy native employees, who seem to consider the 'luxuries' of civilization (flour, molasses, etc.) more necessary than do either Stefánsson or myself. A native lives only in the present and considers that he is justified in demanding whatever creature comforts are obtainable, while we are willing to make sacrifices in order to accomplish an end some distance in futurity."

Dr. Anderson arrived at San Francisco November first on the whaling vessel "Belvedere," immediately telegraphing the Museum and Mr. Stefánsson of his safe arrival. He has repacked ready for shipment across the

country the sixty cases of specimens brought out of the Arctic by the expedition and will himself reach New York it is hoped before the end of November. The following are a few excerpts from his letters of the past four years:

#### HUNTING MOUNTAIN SHEEP AND CARIBOU IN THE ENDICOTT MOUNTAINS

.... I shall go up into the mountains near here with one of our natives, either up the Hula-hula or Kugruak, and try to get some mountain sheep before the snow is too deep [Autumn, 1908]. This part of the Endicott range is said to be the best mountain sheep country left in Alaska, and the natives kill a good many at all seasons of the year. The caribou are killed in considerable numbers all along this coast and are said to be working westward in greater numbers every year to the Colville River region and up toward Point Barrow.

Auktalik told me that his brother Umigluk with two companions had several years before crossed the divide from the head of the Hula-hula River and hunted on a river flowing south (I believe the middle or east branch of the Chandler), a northern tributary of the Yukon, and had found plenty tuktu (caribou).

There is an immense territory south of the Endicott Mountains and north of the Yukon which the white prospectors have not yet reached except in a few places. The Ramjart House and Fort Yukon Indians do not range so far north except in summer, and the Eskimo seldom cross the mountains. To the knowledge of the natives, no white man had ever crossed the mountains in this region.

We decided that it would take too long to return to Flaxman Island for flour, etc. before crossing the mountains and having as much frozen mutton as we could carry on our sleds, after leaving a few carcasses cached to fall back upon near the head of the Hula-hula, we crossed the divide on December 4 [1908]. The week before we had hauled a load of meat within a quarter of a mile of the summit and camped one night (December 3) above the willow line. We now took the sleds over singly by putting ten dogs in harness, with six men boosting and pulling. Descending a rocky creek gorge, we reached large willows before night. The second day devoted to hunting brought in one sheep out of a flock of eleven seen. The third day's travel brought us to green spruce trees. Ptarmigan were scarce and hard to find as the river valley was wild. We were on pretty short rations before we struck the caribou herds in the high foothills on December 18. The snow was very deep and soft on the south side of the divide, our sleds were soon stalled and we were delayed three days cutting trees, hewing out boards and making toboggans. A trail had to be snow-shoed ahead and travel was slow, all hands "slugging" in harness with the dogs. Two porcupines and a great gray owl proved welcome additions to our larder. Canada jays were observed a few miles north of the limit of spruce trees and ravens were often in sight. During the latter part of December we saw many caribou, at one time over a thousand within rifle range — a magnificent spectacle. We lived in tents until December 27, when we built a hut of poles covered with blocks of moss, living in it until late in January [1909], occasionally seeing caribou which were always moving eastward.

#### EASTWARD ALONG THE ARCTIC COAST

I started west from Flaxman Island [April, 1909], after finishing the preparation of my specimens, and sledged as far west as Smith Bay. Here I found a note from Mr. Stefánsson who had preceded me, stating that advices were received at Point Barrow to the effect that no whalers were coming into the Arctic Ocean this summer, and that thus we were left to our own resources to get our belongings east.

We at once started hauling goods and supplies east from our cache at Smith Bay and by strenuous effort with two sleds succeeded in getting five sled-loads of gear and a 33½-foot skin umiak within a few miles of the Colville delta before water overflowing the sea ice put an end to sled travel on June 14 [1909]. We launched our boat on June 23 and have spent the time since then moving eastward, paddling, sailing or tracking. I have spent all available time in collecting and have taken a fair series of eggs and nests, including whistling swan, black brant, Hutchins's goose, black-bellied and American golden plovers, turnstone, red-backed, pectoral and semipalmated sandpipers, northern and red phalarope, snowflake, Lapland longspur, parasitic jaeger, red-throated loon, willow ptarmigan, etc., all from the vicinity of Colville delta.

## DIFFICULT TRAVEL WITH BULKY SLED-LOADS OF SUPPLIES, EQUIPMENT AND COLLECTIONS

We left Tuktuyaktok October 17 [1909], and have been compelled to follow the coastline very closely all the way, open water and dangerous thin ice off shore preventing us from crossing bays and inlets, and deep, soft snow making inland travel impracticable. Our Eskimo sleds were heavily loaded with equipment and collections, necessary supplies and heavy frozen fish for dog food.

We camped November 2, about two miles north of Kublurak (the outlet of Eskimo lakes into southwest corner of Liverpool Bay), and the next day crossed a deep estuary, seven or eight miles wide at the mouth of a large river known as the Kugalluk (the western mouth of the Anderson River). We crossed in a blinding snowstorm and were stopped near the eastern side by a strip of very thin ice, from one hundred to two hundred yards wide. We followed the edge of this lead south for about half a mile and barely succeeded in crossing a lead about seventy-five yards wide, rushing the sleds across singly although the ice bent in deep undulations.

## SOME HABITS OF POLAR BEARS

We (Billy, Pikalo and myself) left Horton River on the morning of November 23, [1909] to get a large number of needed articles still cached in an old house near the wreck of the steam whaler "Alexander" at Cape Parry. The thermometer stood at thirty-one degrees below zero and a gale was blowing from west-northwest, with snow drifting everywhere, but as the wind was a little abate, we made good time. We expected to reach Langton Bay in one "sleep" so took only six small fish with us — one apiece for supper and the same for breakfast. However next day the wind increased, blowing all the ice away from the beach, necessitating much hard pulling over bare ground and sand-covered snow. November 25 we were unable to travel at all, and we reached the Langton Bay cache in the evening of the twenty-sixth after a fast of sixty hours.

We reached the cache near the wreck of the "Alexander" on December 3. Polar bears had broken into the house and devoured four boxes (about 500 pounds) of whale blubber (all our dog food), two slabs of bacon, overturned and spilled a ten-gallon can of alcohol (all we had left), and knocked things about generally. Bears had also cleaned out a cache of Ugyuk (bearded seal) meat and blubber which Stefánsson had made some distance down the fiord.

## WILD GEESE AND WHISTLING SWANS IN THE COPPERMINE REGION

The first goose of the season (*Anser albifrons gambeli*) appeared at Kittigaryuit May 5 [1910], but no great numbers were seen until May 27. The American white-fronted, Hutchins's and lesser snow geese were most abundant at first, while later the black brant came in great flocks. Whistling swans were also fairly common.

## THE NESTING OF BLACK BRANTS

Just before leaving my spring quarters, I accompanied a native named Kalakotak on a sled trip up the coast after goose eggs. We started on the thirteenth of June [1910], and had very hard traveling through deep water and slushy snow on the ice of the estuary. About a hundred pair of black brant were nesting on little islands in a series of shallow lakes or ponds about three-fourths of a mile from the coast. Two or three nests contained four eggs each, but the great majority contained two. Three or four nests of glaucous gulls were also found.

## SUMMER IN THE MACKENZIE DELTA

Snow buntings were observed carrying feathers, and Lapland longspurs' nests were found with incomplete sets of eggs. We returned on the sixteenth [June, 1910] finding traveling much better as most of the snow had disappeared, and water had run down through cracks, leaving a smooth surface of solid ice five or six feet thick but rapidly disintegrating into sharp prismatic needles. Travel was rapid but exceedingly hard on the dogs' feet, which had to be protected by boots, or often rewrapped in calico. Sailing from Kittigaryuit on June 19, three days brought us from the ice fields into the almost tropical heat of the Mackenzie delta proper. Mosquitoes were abundant and on the twenty-second I found a robin's nest with four young birds. The season seemed to be fully a month further advanced than it was twenty-five or thirty miles north. Yellow warblers (*Dendroica aestiva*) were seen on

Richard Island and other smaller islands nearby. They were common throughout the delta. Fresh moose tracks were seen and rabbits appeared to be numerous. East of the Mackenzie, rabbits seem to have been practically extinct the past winter. On Horton River where a few years ago they were abundant, only one or two were seen.

#### EVENTS INCIDENTAL TO A ZOÖLOGICAL SURVEY

We had only four dogs and only two of them were able to pull very much, but we decided to take a light sled, "pack" our guns across the barren ground, and use the sled on the mountains. The sled pulled very heavy [September 21, 1910] over sparsely grassed hilltops near the coast, which were generally fine sand or clay with scattering sharp stones and rocks. We succeeded in crossing the divide the same day however and camped on the southern slope although with no fuel but green willows. Next day, September 22, we moved south about six miles before we sighted a band of ten caribou. We made camp at once and succeeded in killing eight. It was dark before I finished skinning two for "specimens" and failing to find camp I was obliged to walk the rest of the night to keep from freezing.

#### TOMCOD AND OTHER FISH OF THE ARCTIC COAST

We reached the fishing camp at Okatou near Langton Bay March 11 [1910]. The day we arrived, three or four people had caught nearly a sled-load of fish (tomcod) in half a day's fishing. A very few codfish (apparently true cod, but none over fifteen inches long) were also being caught. The fishing is done in about four fathoms of water. The female fish of both species were carrying eggs. The tomcod have a slightly sweetish taste when boiled. . . .

. . . On the return from Langton Bay, we had crossed fresh tracks of a band of caribou going north in the Parry Peninsula. This induced me to make a week's trip [November 14-21, 1910] to the fishing place on the northeast side of Langton Bay. Here we looked for the caribou without success. The tomcod were not so abundant as last spring, although we could hook forty to fifty through the ice any day. I caught one larger fish, about two pound weight, apparently a true codfish. A few sculpin were also hooked but no other species. In the summer, Ilavirk had caught "whitefish," salmon, trout and a few small flounders in the vicinity.

#### BARREN GROUND BEARS — THE ONLY COLLECTION IN THE WORLD

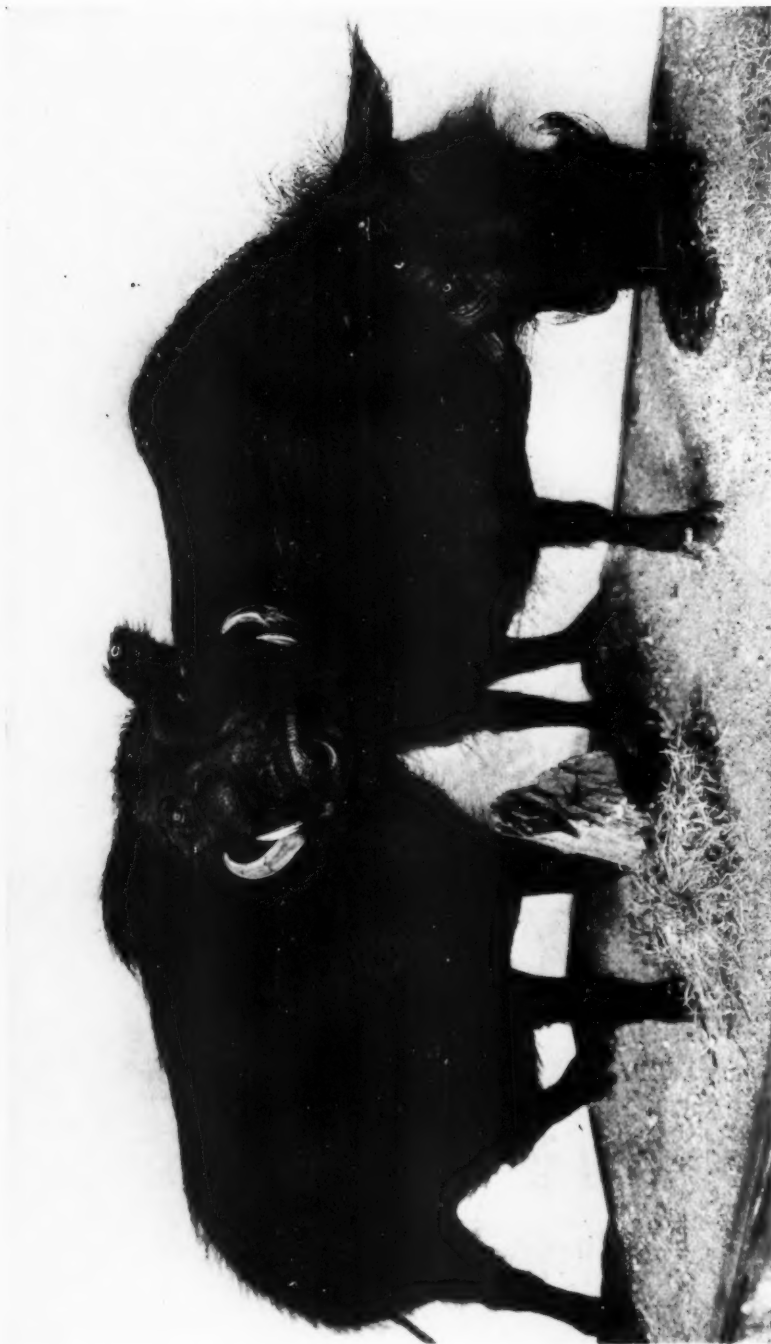
Mr. Stefánsson reports [December, 1910] brown bears in this region, probably *Ursus richardsoni*. The numbers which he has seen and killed around Langton Bay and Horton River and on the coast east of Cape Lyon make it very probable that a good series can be obtained, though probably not in a single season. Barren ground bears from any locality are not very abundant in museums, and I am anxious to investigate and bring specimens out. . . .

. . . Our collection of barren ground bears [January, 1911] consists of seventeen mountable skins, with skulls and legbones, and two extra skulls — both sexes, all ages and sizes — spring, summer and fall specimens.

#### TRANSPORTING VALUABLE COLLECTIONS OVERLAND

I started April 23 [1911], with one Eskimo named Tannaumirk, seven dogs and two toboggans, hauling two good-sized loads of ethnological specimens with caribou skins and skulls from Coppermine River and Coronation Gulf. We made good time up Coppermine River and found no signs of thaw until we were some fifteen miles southwest of Dismal Lake, May 1. The warm weather continued, the snow disappeared from the Barren Grounds with startling rapidity and we had to drag sleds over many bare ridges before reaching our house on the east branch of the Dease River. We remained here on the third, drying, packing and labeling such specimens as required it, and started down the river on the morning of May 4. There was a little water in places on the river, but the farther we went the worse matters got — no snow on barren uplands, impassable brush in the spruce trees along the river (impassable for our bulky sled loads), and river flooding rapidly. We were compelled to halt in the evening, having laboriously made about ten miles in ten hours. We could not go back and to protect our specimens were obliged to spend nearly two days in cutting down large green spruce trees to make a square cache of logs fitted together strong enough to keep out wolverines for a time at least. Nothing short of a burglar-proof safe will keep a wolverine out for a great length of time.





GIANT FOREST PIGS

Specimens brought from Africa by Mr. Alfred J. Klein and mounted by Mr. F. Blaschke. The forest pig is exceeded in size only by some long extinct species whose fossil remains are found in our western states but these were not pigs in the true sense of the word, and while the long-faced pig of Borneo is as tall as its African cousin, it is by no means so massive or so picturesquely ugly.

## THE GIANT FOREST PIG

By Frederic A. Lucas

AFRICA is not only preëminently the land of mammals; it is the home of many large and curious beasts. Something like 2400 years ago Hanno, the Carthaginian, sailing southward along the coast of Africa, encountered some "wild men" which he slew and flayed, and on his return, deposited their skins in the Temple of Astarte.<sup>1</sup>

This was the first and one of the most remarkable of animals to be brought from Africa but since that time there has been brought out many another strange beast, the most notable, the okapi, and one of the latest, the pigmy elephant, now in the New York Zoölogical Park. It is quite probable that still others remain to be discovered, although with the rapid opening up of the country and its exploration by sportsmen and ivory hunters, it would seem that the possibilities must ere long be exhausted.

For something like fifteen years it was suspected that the forests of Central Africa harbored some giant member of the hog family, but owing to the retiring habits of the animal, it was not until 1904 that a specimen fell into the hands of a naturalist and that the creature was properly introduced to the scientific world. Had the animal known that it was to be christened *Hylochaerus meinertzhageni*, it probably would have remained hidden for another fifteen years. The specimens placed on exhibition were taken by Mr. Alfred J. Klein near the Channa River, and were mounted by Mr. F. Blaschke.

The forest pig is most nearly related to the well-known wart hog, which it exceeds in size if not in ugliness. Like the wart hog, the head of the forest pig is long, the upturned tusks heavy, the snout unusually broad and there are callosities just below the eyes. The body is deep and heavy, the legs slender, so that the animal is at once quick and powerful.

Very little is really known about the forest pig, partly on account of its habits, which like those of most pigs are nocturnal, partly because its chosen home is in the tall grass of the African jungle. The hunter forces his way through the bamboos and underbrush, up to his eyes in the grass — there is a grunt, a rush, and the game is far away without having even been seen. On the slopes of Mount Kenia at an elevation of six thousand feet, where the bamboo jungle meets the forest, Mr. Carl E. Akeley found evidences of the presence of numbers of these pigs, their tracks following the elephant trails for long distances, and here and there were patches of upturned ground. Most curious of all were regular haycocks, two and three feet high, eight and ten feet in diameter, evidently piled up by this animal. What was the object however of these piles of fresh grass, Mr. Akeley does not venture to say.

<sup>1</sup> Kipling has used this incident as the basis of one of the adventures of the "Knights of the Joyous Venture." It has been suggested that the animals taken by Hanno were only baboons, but this suggestion came from a disappointed gorilla hunter, and we prefer to think of them as gorillas, the more, that Hanno was well acquainted with baboons.



THE SEA WORM GROUP, FROM STUDIES AT WOODS HOLE, MASSACHUSETTS

Two colored photographic transparencies [glass] six feet in length are placed one before the other for the background above the water surface. Below the surface the background is constructed of five successive sheets of painted glass. Most of the animal and plant life shown is made of celluloid or blown glass or is modeled in wax. The group is lighted by daylight which filters through the transparent background from the window against which the case stands



Collecting for the sea worm group at Devil's Foot Island, Woods Hole. A water-glass was used to locate the worm burrows and to make observations on the sea bottom. Living specimens of the worms were brought into the laboratory and studied in sea-water aquaria. From these were made the sketches and photographs for the models used in the group

### A NEW EXHIBIT IN THE DARWIN HALL

THE MARINE WORMS OF THE ATLANTIC COAST SHOWN IN A HABITAT GROUP<sup>1</sup>  
MADE FROM FIELD STUDIES AT WOODS HOLE, MASSACHUSETTS

*By Roy W. Miner*

THE series of window groups in preparation for the Darwin hall will portray the invertebrates in their natural surroundings and emphasize certain important biological principles. The first of these principles is that of the struggle for existence — that battle for life which must be waged by all living creatures.

The second principle involves the immediate result of this struggle — namely, the establishment of a balanced association composed of the surviving animals and their environment, within which the struggle for existence continues, but on practically equal terms.

The third principle, that of adaptation, implies that the surviving creatures forming this association, in the course of generations change in form and habits to become more and more fitted to their appropriate positions in the closely interlocking community. This change is the logical result of the continued struggle for existence acting under the conditions

<sup>1</sup> The fieldwork, composition and effects for this group are the work of the author. The wax-modeling was done by Messrs. I. Matausch and E. Mueller, the glass work by Mr. H. Mueller, and the coloring by Messrs. S. Shimotori and I. Matausch, under the supervision of the author. Through the courtesy of the United States Fish Commission, the laboratories of its Woods Hole station were put at the disposal of the museum for the fieldwork of this group.

of the particular community, made possible through the fourth and fifth principles — namely, that no two animals are exactly alike in the same or successive generations and may differ greatly from one generation to the next, and that the differences of the surviving animals tend to be inherited by their offspring. The net result of these principles shows that the true unit in animal life is not the individual, but the individual with its animate and inanimate environment.

Thus it will be seen that a museum group representing as in life a natural association of animals will necessarily illustrate within itself all those laws which lie at the basis of the doctrine of evolution, to the presentation of which the Darwin hall is dedicated.

The most recently installed of these groups shows the animals of a portion of the sea bottom of our Atlantic coast where the conditions of life are favorable to the existence of those curious forms, the marine worms. These animals are particularly suited to illustrate the principles of evolution, because of their diversity of form and habits, and their close adaptation to their surroundings.

The locality chosen for the setting is the Greater Harbor of Woods Hole, Massachusetts. In the upper part of the group, a distant view of the wharves and buildings of the United States Fish Commission is shown on a colored, photographic glass transparency six feet in length. In the middle distance, on a similar transparency, is the grass-covered spur of Devil's Foot, a small island at the harbor entrance. In the cove sheltered by the island and its projecting spur, the tides have deposited their load of silt washed from neighboring points to form a muddy bottom.

Below the surface of the water, which is here represented as if in section, the border of an extensive patch of eel grass growing in the mud is shown to the left and is continued into the transparent background. Here is seen the animal life to which such conditions are favorable. Lurking at the edge of the eel-grass is a green crab, while just beyond its reach, mud minnows are nibbling at the seaweed. A whelk crawls over the sand searching for the clams and other bivalves which form its food. A scallop disturbed by their maneuvers "jumps" in its awkward flopping fashion into the eel-grass. Hermit crabs, mud snails and shrimp are busily fulfilling their duty as the street-cleaning department of the shallow waters, while mud crabs hide in every crevice.

Finally below this zone of shallow-water life, there is shown still another world composed of dwellers beneath the sea bottom itself. These are the marine worms. Burrowing in the mud below the eel grass, tunneling in the sandy mud of the open spaces or in the still more sandy stretches where the bottom slopes up toward the pebble-strewn sea-margin, is this underworld of creatures, strange in form and habits, often magnificently clad in armor of iridescent coloring, adorned with breathing plumes and grotesque





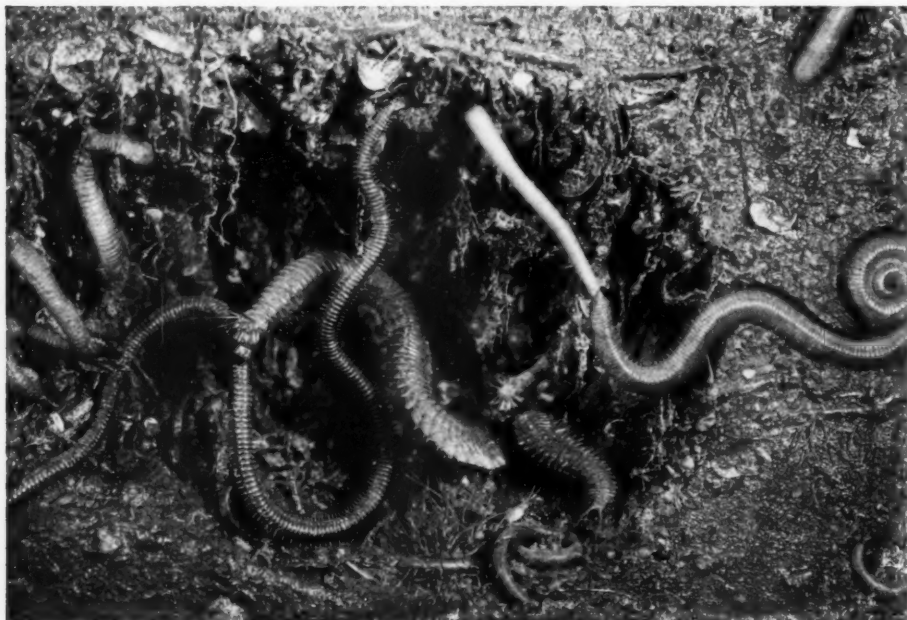
A bit of the sea bottom near the shore where the tide washing away the mud, leaves only sand and pebbles. Here are the chimneys of the plumed worm protectively concealed by shell and weed fragments. Here too, delicate transparent shrimp, scavengers of the ocean margin, are busily cleaning dead shells of their decaying fragments



A scallop, disturbed by the mud minnows, has "jumped" in awkward flopping fashion into the eel grass



Mr. Ignaz Matausch, expert preparator, and the group at an early stage in the work. The miniature sketch model at the upper left hand was constructed at the seashore (Woods Hole) for study of composition. It is made to the scale of three inches to the foot. A framework for the finished group, six feet in length, was constructed in the Museum, and the sea-bottom modeled in. Temporary wax dummies were used to determine the final position of the various worm-tubes



A cavity is represented arbitrarily hollowed out among the roots of the eel grass to disclose the worms burrowing in the mud. A clam-worm [center] is attacking the iridescent opal worm. Beak-throwers are swimming corkscrew fashion [at left in cut], or throwing out a club-shaped proboscis armed with hooks [at right in cut]. A coiling fringed worm [middle below] extends its threadlike breathing organs in all directions. [Accurate representation in wax and glass. See preliminary sketch model in lower left hand corner of cut above]

with tentacles, bristles and spines. The chimneys of their houses project above the sea bottom here and there, while our license as group-makers permits us to expose and section their burrows to show the inhabitants therein.

Driven to dig and burrow and to build underground homes for themselves, the inhabitants of the mud and sand have preserved their race from extinction by thus concealing their soft bodies from their mortal enemies the heavily armored crabs and swift-moving fishes which hold supreme power in the water world above. But even in the mud the struggle for existence goes on. Many of the worms are predacious and actively prey upon their fellows. Some of the larger mollusks like the sand-collar snail, dig rapidly through the soil and seize upon the worms in their burrows. They are not even safe from the attacks of fishes, for scup and tautog eagerly root in the mud for them. Hence the worms have been driven to all sorts of protecting and concealing devices, to hinder or prevent these attacks. Many build tubes and shells for themselves, and in the course of time have adapted their form to their habitation so that they can live in no other way.

Let us examine the group more closely for examples of these various adaptations. To the left among the eel-grass roots, a cavity is represented arbitrarily hollowed out to disclose the worms burrowing there. The predacious clam worm (*Nereis virens*) actively wriggles from its burrow and with powerful jaws viciously attacks its nearest neighbor, the long and slender opal worm (*Arabella opalina*), so-called from the changing opalescent hues of its many body rings. Beak-throwers (*Rhynchobolus dibranchiatus*) swim about them with a curious corkscrew motion, and suddenly shoot forth a club-shaped proboscis armed at the end with hooklike jaws. These are all actively moving species. Their many segments are similar and furnished with similar segmental limbs throughout, and to this extent they probably represent the structure of the primitive ancestral type of this general group.

They must be contrasted however with their tube-dwelling relatives such as the plumed worm (*Diopatra cupræa*) which builds deeply penetrating tubes, the outstanding chimneys of which are protectively concealed by the shell and weed fragments cemented about them. One of these tubes is shown in section, disclosing its occupant, whose blood-red gill plumes and segmental limbs are well developed on the forward portion of the body, where they are near the tube-opening, but are reduced to small rudiments or are altogether wanting on the hinder extremity. This is a partial adaptation to the tube-dwelling habit.

The most marked case of adaptation however is that of the parchment worm (*Chætopterus vario pedatus*) the U-shaped tubes of which are shown in the center of the group with their chimneys extending above the sea-

bottom. One of these in section, discloses its curious occupant, the strangest of all the worms. At first sight all resemblance to the other worms seems to have become lost, and its entire structure is closely adapted to its peculiar habitation which it never leaves. The appendages of the middle segments of its body have united to form three circular "palettes" which fit closely the interior of the tube and act like the pistons of a suction pump, drawing the sea water in through one of the chimneys of the tube to flow out at the other. This incoming stream bears the multitude of minute organisms which form the food of the worm, and are abstracted by a special apparatus as the water current passes over its body. Other greatly modified worms are shown, such as the fringed worm (*Cirratulus grandis*) with its threadlike breathing and prehensile organs, and the trumpet worm (*Pectinaria belgica*) which builds a funnel-shaped tube of sand-grains and digs rapidly in the sand with a pair of golden combs borne upon its shoulders.

All these are true worms which have become adapted in various ways to their environment. The sandworm (*Phascolosoma gouldii*) however, although externally wormlike, is internally of so different a structure that it is doubtfully classed with the worms at all. Several are shown in the group; some in a contracted condition, others expanded to disclose the slender graceful neck and head wreathed with delicate flesh-tinted tentacles.

In a second arbitrary cavity, are shown several of the so-called acorn "worms" (*Balanoglossus kowalevskii*)—peculiar creatures with red "collar" and tapering proboscis which they fill with water until rigid and utilize as a digging organ. These "worms" swallow the mud for the sake of the animal and vegetable matter contained in it, and after all nutriment is extracted, cast it forth on the sea bottom at the entrance of their burrows molded into little stringlike piles, many of which are represented in the group.

This acorn "worm" however has a far greater interest for science than in its peculiar habits and adaptations. In spite of its wormlike body, it is actually classed as an extremely primitive member of the same great group to which we ourselves belong, the chordates, since it possesses certain structures found only in that group. Its wormlike body, and probably that of the sand worm, is a secondary adaptation to its burrowing mode of life and illustrates the phenomenon of *parallelism*, the acquirement by totally unrelated organisms of similar form or structure as the effect of a similar environment.

To sum up, the marine worms or any other group of animals in the midst of their natural environment, may be considered as the members of an interlocking and balanced association which is the net result and exemplification of the laws underlying evolution. The great diversification of form among the marine worms makes this especially clear, since diversification means adaptation in the world of life.

## A FISH OUT OF WATER

*By Bashford Dean*

**F**AITH in our conception of what a fish ought to be is certainly shattered when we find one which can live for months, possibly for a year, out of water — which breathes by means of gills when in water, but with a lung during the summer drought, inhaling and exhaling air as though it were a land-living animal. Such a queer fish was recently sent by Dr. Joseph A. Clubb to the American Museum of Natural History in an exchange with the Public Museums of Liverpool. It came from the Gambian region of Africa, coiled up in a kind of cocoon, deeply sunken in a large clod of earth which months before had been a bit of the bottom of a dried-up stream.

When received at the American Museum the cake of earth showed, as a sole sign that anything alive was within it, a little tunnel-like opening where the fish burrowed when the earth was still soft, and through which the fish later secured its supply of air for breathing.

Indeed it is this opening which gives us the clue as to how the dormant fish can best be examined. For we may begin at the edge of the tunnel and chisel the hard earth away, and on reaching the bottom we may, cutting with greater care,

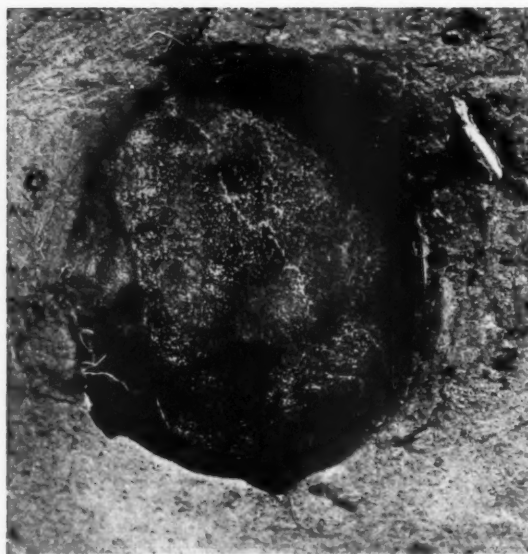


A block of dry earth [greatly reduced in size] in which is encased a living lungfish. The funnel-like opening for air shows at the upper right hand. This block of earth came from Africa in a box provided with holes to admit air for the fish's breathing. Metal grating over the holes guarded the dormant fish against the attacks of shipboard rats and roaches



The fish alive [greatly reduced in size] and newly released from its cocoon in the block of earth. Its fins are crumpled: it is covered with slime and is dark, almost black in color. Compare with frontispiece





After the earth has been chiseled away down to the brown cocoon which contains the fish. At one point this cocoon shows the pit through which the fish is breathing. The pit leads into a tube of hardened slime which goes into the fish's mouth and conducts the air directly into the lung



The cocoon seen from the side when nearly separated from the mass of earth. It is of papery texture and is formed of hardened layers of slime secreted by the fish's body

expose the side of the capsule within which the fish is tightly coiled. The whole mass is then placed in tepid water to soften the wall of the capsule (which was formed by mucous secretion on the surface of the fish's body) and thus to allow the fish to escape. Within a few minutes after the present cocoon had been placed in water, the papery wall or shell showed movements, but before the fish broke its way out, a trap door was cut in the side of the capsule so that a photograph could be taken. The mass was then again placed in water and within a few minutes the fish emerged.

This lungfish is now exhibited in an aquarium on the fourth floor of the Museum in the hall of fossil fishes. It has been placed there since it is at home, scientifically speaking, among fishes which lived millions of years ago and whose race is almost extinct. It furnishes, in fact, an excellent instance of the survival of a race of animals from a very ancient period of time. It has further claim to our interest, for we can safely say that a lung-

fish pictures the kind of fish which gave rise to the earliest land-living animals, or the stock of amphibians, reptiles, birds and mammals. In fact the present little fish is known by anatomists to have many striking similarities to salamanders. Thus in a general way, its limbs represent a stage between fins and hands, and it uses them in a fashion which suggests a salamander. So also in structures of skin, muscles, skeleton and brain, the fish is to a certain degree, a connecting link between the true fishes and the four-footed animals.

As far as is known, this is the second specimen of a living lungfish to be brought to the United States, and those who are interested in natural history in general and in fishes in particular, would perhaps be glad to profit by the opportunity of seeing it alive. Its scientific name, *Protopterus annectens*, by the way, refers in the first word to its supposedly primitive fins, and in the second to its being intermediate between fishes and amphibians.

### THE IMPORTANCE OF INSECTS

By Frank E. Lutz

INTRODUCTORY NOTE.—There are few halls in the Museum better arranged to instruct in the particular animal class represented and in addition to teach the principles of biology than the insect hall. It is used continually by high schools as a laboratory for their classes who, because the hall is so well arranged in correlation with the high school courses and is so clearly and fully labeled, can be sent to the Museum with lists of questions for undirected observation and study.

The hall has a separate exhibit, for example, covering the importance of insects. This contains not only such objects as silk, shellac and other useful products of insects, wax models to show the action of the bumble-bee in pollinating the flowers of the apple tree and thus insuring the harvest of fruit, etcetera, but also diagrams telling with emphasis certain well proved facts concerning insect-borne diseases, which can but make the boy or girl draw his own conclusions as to the need of action and the value of action in such matters as public hygiene.

This is but one exhibit. There are many others covering the subject matter of entomology and its practical relation to agriculture as well as special exhibits illustrating such biological theories as sexual dimorphism, fluctuating variation, geographical distribution and heredity.—EDITOR.

THOREAU was right in believing that there was more to entomology than the study of insect pests.<sup>1</sup> Yet if there were not, entomology would still be the queen of biological sciences. Agriculture and forestry are injured to the enormous extent of eight hundred millions of dollars annually by less than one per cent of the insects of the United States; the fourteen thousand deaths annually from malarial fevers in the United States, to say nothing of malarial illnesses not resulting in death, are due

<sup>1</sup> "We accuse savages of worshipping only the bad spirit or devil. Though they may distinguish both a good and a bad, they regard only the one which they fear, worship the devil only. We too are savages in this, doing precisely the same thing. This occurred to me yesterday as I sat in the woods admiring the beauty of the blue butterfly. We are not chiefly interested in birds and insects, for example, because they are ornamental to the earth and cheering to man, but we spare the lives of the former only on condition that they eat more grubs than they do cherries, and the only account of the insects which the State encourages is of the insects injurious to vegetation."—THOREAU.

solely to one species of mosquito; typhoid, tuberculosis and other diseases are peddled in all parts of the world by the common house-fly; yellow fever, bubonic plague and sleeping sickness have made large portions of the globe practically uninhabitable to the human race solely through the work of insects.

On the other hand, it is impossible to estimate the material benefits that insects confer. Were bees, butterflies and other pollinating insects suddenly wiped out of existence, the majority of the world's flowers would go with them leaving only such as the field corn and other grasses, and fruit crops would then be failures. A few insects damage fruits in the United States to the extent of twenty-seven million dollars annually, but practically all of the one hundred and thirty-five million dollars worth of fruit that we use owes its existence to insects. It would be impossible to get a single crop of clover seed without the aid of insects while insects damage but ten per cent of the total hay crop. When fig-growing was first attempted in this country, the trees never held their fruit until ripe. A minute insect which fertilizes the figs in the Mediterranean region was imported and now thousands of pounds of the finest fruit in the world are produced every year in the United States.

Often a crop is injured by an insect and relieved from that injury by another insect. For example, twenty years ago the orange and olive orchards of California were on the verge of destruction on account of scale insects, when two species of predacious beetles were imported from Australia and a little parasitic fly from Cape Colony. So thoroughly did these accomplish the task upon which human efforts had been of no avail that the destructive scales are now as scarce as they were once abundant, and oranges and olives flourish. These are only a few cases, hundreds of species of insects throughout the country are doing similar beneficial work. In addition we have many direct products of insects such as the shellac on our furniture, the silk in our decorations, the honey for our bread and even many of our medicines.

Moreover insects are important to all interested in natural history because of their large number, not only of individuals but also of species. Approximately three-fourths of the known kinds of animals are insects. There are more than fifteen thousand species of insects within fifty miles of New York City as compared with about thirteen thousand species of birds in the entire world and less than half that number of mammals.

Insects form a group surpassing all others in material for study of instinct or racial behavior, of variation in form and color; as also for research in problems in heredity since the breeding is so rapid that the chain of life can be kept unbroken for many generations.

## FACTS AND THEORIES RELATING TO THE ANCESTRY OF MAN<sup>1</sup>

By W. D. Matthew

THE literature bearing upon the ancestry of man has been enriched by a number of valuable contributions during the past year. A memoir of Dr. Max Schlosser upon the early Tertiary fauna of the Fayum district in Egypt, contains descriptions of three new genera which the author refers to the higher Primates (Anthropoidea), one of which (*Propliopithecus*) he regards as ancestral to the higher apes and man. The oldest anthropoid Primates heretofore known are from the Miocene or later Tertiary. Dr. Schlosser's discoveries are from the Lower Oligocene or perhaps Upper Eocene. [There is a great collection of fossils from the Fayum in this Museum including several specimens supposed to be Primates but not yet carefully studied.]

The remarkable human skull of Chapelle-aux-Saints in France has been fully described and illustrated by Professor Marcellin Boule of the Paris Museum, who regards it as pertaining to the same type as the "Heidelberg man," a lower jaw found at the base of the Pleistocene formation at Mauer near Heidelberg, and representing a clearly distinct and primitive species of the genus *Homo*. A cast of the Heidelberg jaw is on exhibition in the Primate case in the fossil mammal hall, and Dr. Boule has promised President Osborn a cast of the Chapelle-aux-Saints skull.

A very important paper was read by Dr. G. Elliot Smith before the 1912 meeting of the British Association for the Advancement of Science, and has attracted considerable newspaper attention since. Dr. Smith regards the pen-tailed tree shrew (*Tupaia*) as a living representative of the more primitive mammals from which the lemurs, monkeys, apes and in turn man have successively evolved. The evidence upon which this important conclusion is based is due partly to the author's own studies, partly to researches by Leche and Carllson of Stockholm and W. K. Gregory of this Museum. The Primates have hitherto formed a group apart from other mammalian orders,

<sup>1</sup> Dr. Matthew's article is of significance for the members of the American Museum in that it gathers together some of the year's new sources of information on the question of the antiquity of man at a time just previous to an important series of lectures on that subject announced by the trustees. These lectures will occur in the Museum auditorium on Wednesday evenings from November 20 to December 18 inclusive. The opening lecture by President Henry Fairfield Osborn of the American Museum will be a consideration of the most ancient types of man. This will be followed in other lectures by evidences of the antiquity of man from Old World culture by Professor George Grant MacCurdy of Yale; New World physical and cultural evidences by Professor Livingston Farrand of Columbia; and the proofs as set forth in North American archaeology by Professor Nels C. Nelson, formerly of the University of California and at present of the staff of the American Museum. — EDITOR.

with much uncertainty as to which if any of the lower mammals were ancestral to them. It is now reasonably clear that they must have been derived from early Eocene or Cretaceous ancestors related to the Tupaiid family of insectivora. The next step will be to confirm or modify this theoretical conclusion by the evidence of fossils showing the various stages of transition from the higher Primates of the later Tertiary through the early lemuroid Primates into insectivorous ancestors related to the tree shrew. The materials for this purpose lie at hand, we believe, in the American Museum collections.

As the result of ten years' expeditions in charge of Associate Curator Granger to the Eocene formations of the western states, a great collection of fossil mammals has been brought together, peculiarly rich in the remains of smaller species, and containing numerous specimens of lemuroid Primates and of Insectivora. Some of the latter appear to be related to the tree shrews and preliminary studies indicate various transitional characters between the two groups. So far they confirm notably the conclusions of Elliot Smith. The more thorough study of these collections should serve to clear up to a great extent the early history and derivation of the order of Mammalia to which man belongs.

To confirm thus the deductions of comparative anatomy by the facts of palæontology is a peculiarly pleasant and inspiring task. Less congenial, but no less necessary is the critical examination and disproof if erroneous of other and conflicting theories, by careful sifting of the evidence upon which they are based. To such a task has Dr. Ales Hrdlička of the United States National Museum addressed himself, in his review of the evidence which has been brought forward by the late Dr. Florentino Ameghino for the South American ancestry and evolution of man. The writer of this notice has elsewhere expressed his high appreciation of Dr. Ameghino's ability and services to science, while intimating disagreement with many of his theoretical conclusions. Dr. Hrdlička, after careful study upon the spot of all the evidence brought forward by Ameghino in support of his favorite theory, comes to the conclusion that none of it can be regarded as indicating a very high antiquity of the human race in South America nor as affording any conclusive proof of earlier stages in its evolution.

The *Origin and Antiquity of Man* by Professor George F. Wright is a very able and well-written discussion of the evidence on this subject, considered from a viewpoint almost forgotten in modern scientific progress, that of the "reconcilers" (of Genesis and geology). Dr. Wright is a high authority on glacial geology, and his criticisms of the excessive estimates made by some authors of the length of the glacial period and of the antiquity of the earliest evidences of man, deserve especial consideration. It is not intended to review Dr. Wright's volume here, merely to mention it as a book worth reading whether or not one agrees with its conclusions.



## NEW ACCESSIONS OF METEORITES

*By Edmund Otis Hovey*

**T**HROUGH the generosity of Mr. J. P. Morgan, Jr., the Museum secured recently the collections of minerals and meteorites left by the late Stratford C. H. Bailey of Oscawana-on-Hudson. Mr. Bailey was an indefatigable collector for many years and he assembled representatives of nearly three hundred falls and finds of meteorites. At least twenty-two of these are new to the Museum's already great collection. The gem of the collection is the aërolite or stone meteorite known as Tomhannock. This is a small mass weighing about three and one quarter pounds, but it is nine-tenths of the entire stone that was found in 1863 on Tomhannock Creek in Rensselaer County not far from Troy, New York. It was first described by Mr. Bailey in 1887 and was always highly prized by him and other collectors.

Almost equally valuable from a scientific point of view, is the little fragment which forms practically the whole of the known residue of the aërolite Bethlehem which was seen to fall in the town of that name near Albany, New York, on August 11, 1859. The original size of this mass was only that of a "pigeon's egg" and the present fragment weighs but one-tenth of an ounce. The special interest of the fall lies in the fact that it occurred during an "August shower" of shooting stars.

Besides the two stone meteorites just mentioned, three irons have been described from New York State, namely: Burlington, Otsego County, the largest fragment of which (1528 grams) is in the Shepard collection at Washington, D. C.; Cambria, Niagara County, the largest portion of which (5239 grams) is in the British Museum, London; and Seneca Falls, Seneca County, the chief piece (820 grams) of which is in the Imperial Museum, Vienna. Of these, Burlington is represented in the Bailey collection by a slice weighing 25 grams and Cambria by one of 34 grams weight. Inasmuch as the Museum already possessed 44 grams of Seneca Falls, besides fragments of the other two irons, we now have all the known New York meteorites represented in our collection.

Another choice addition that was received with this collection is a polished slice weighing 908 grams of the N'Gourema, Africa, iron. This meteorite fell June 15, 1900, and is particularly valuable because only nine iron meteorites are known whose fall was seen.

Among other desired specimens likewise coming with the Bailey collection are a 735-gram slice of the Jamestown, North Dakota, iron; a 485-gram slice of the Smith's Mountain, North Carolina, iron; a 48-gram fragment of Tabory, Russia, a stone that was seen to fall August 30, 1877, and a 10-gram fragment of Ploschkowitz, Bohemia, a stone that fell June 22, 1723.

Some of the duplicate material in the collections has been exchanged for a 665-pound entire mass of the Amalia iron meteorite from Gibeon, German Southwest Africa, and a polished and etched slice of another mass of the same fall which shows exceptionally fine Widmanstätten lines, which are strangely curved near the edges of the plate, besides a place where, apparently, the mass broke and welded itself together again in the air, or more probably two masses collided and welded into one.

Other important accessions of meteorites, some of which have come through purchase and others partly through purchase and partly through exchange, are as follows: the entire mass (15,082 grams) of the undescribed Cruz del Aire siderite which was found December 24, 1911, near Sabinas Hidalgo, Nuevo León, Mexico; a 570-gram slice of the Kingston siderite from near Kingston, New Mexico; an 816-gram slice of the Casas Grandes siderite from the prehistoric ruins at Casas Grandes, Chihuahua, Mexico; a 116-gram slice of the Arizpe siderite from Sonora, Mexico; a 600-gram slice of the Shrewsbury siderite from Shrewsbury, Pennsylvania; a 5420-gram fragment of the Ahumada siderolite from Ahumada, Chihuahua, Mexico; a 532-gram fragment of the Admire siderolite from near Admire, Kansas; an entire mass (122,000 grams) of the Estacado aërolite which fell near Lubbock, Texas in 1880; a 650-gram polished slice of another fragment of Estacado to show the internal structure; an entire bolide (650 grams) of the Kansada, Ness County, Kansas, aërolite; a 370-gram slice of the Lampa aërolite from the Desert of Atacama, Chile, a 455-gram slice of the Cullison aërolite from Cullison, Pratt County, Kansas; and a large fragment (12,250 grams) of the Long Island aërolite from Long Island, Phillips County, Kansas.

Most interesting of all perhaps from the popular point of view, is a series of 1080 crusted fragments from a shower of aërolites that fell about 6:30 P. M., July 19, 1912, near the flag station Aztec, six miles east of Holbrook, Arizona. These vary in weight from one-tenth gram (0.0035 of an ounce), the smallest fragment found, to 6650 grams (14.65 pounds), which is the largest fragment that has been found, and amount in all to 16,000 grams (35.2 pounds). The fall which will be known as Holbrook, comprises more than 14,000 fragments, having a total weight of about 220 kilograms (484 pounds) so that the Museum possesses about one-thirteenth of the whole, as to both weight and number of fragments. The series is interesting, not only from the variation of size represented, but also from the fact that the masses show primary, secondary and tertiary crust, formed on the meteorite as it passed through the air and burst in successive explosions.

## AN EXPLORATION OF NORTHEASTERN KOREA<sup>1</sup>

*By Roy C. Andrews*

**P**REVIOUS to 1911 but very little zoölogical work had been done in Korea and that only in easily accessible localities. The few collections of birds and mammals which found their way to museums were from the bare, treeless hills of the south and what forms of animal life existed in the dense forests along the Manchurian boundary between the Tumen and Yalu rivers could only be conjectured. This region had never been visited by a white man, for until thirty years ago Korea offered a

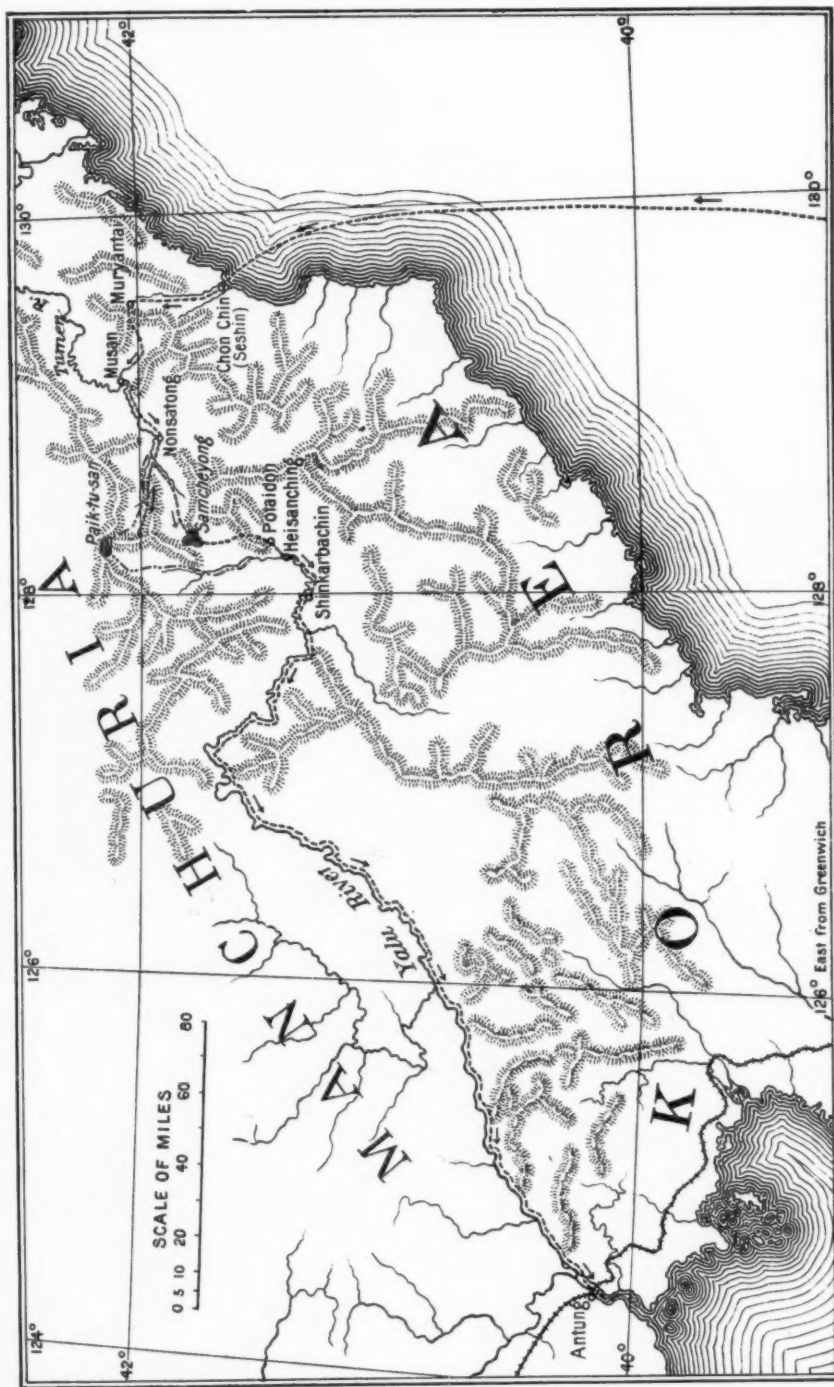


The Museum's expedition leaving Chon Chin. The baggage was piled on three hand cars and pushed up the railway

barred door to the western world and foreigners have found their way but slowly into the remoter corners of the "Hermit Kingdom."

Except in the most general way, almost as little was known of the geography of this portion of Korea as of its zoölogy. The sacred Paik-tusan, the "White-topped Mountain," lying just over the border in Manchuria on a series of wonderful, densely-wooded plateaus, was known to be the source of the great Yalu River which flows almost across Korea and empties into the Yellow Sea on the east. It had been visited by white men, who came from the north through China as early as 1709; and in 1886 three English explorers climbed its pumice-covered slopes and made known

<sup>1</sup> Article and pictures copyrighted, 1912, by Roy C. Andrews.



ITINERARY OF THE KOREAN EXPEDITION  
Map drawn by F. Müller under the direction of Roy C. Andrews

to the western world the existence of the beautiful little lake, the "Dragon Prince's Pool," which lay cradled in its summit 8000 feet above the level of the sea. But the Koreans had prevented access to it from the south or west and until Japanese influence began to be dominant in the country, the secrets of the northern forests remained unknown.

The whale work, which was described in the October JOURNAL, was finished early in March and I went up to Seoul, the capital, to make preparations for the northern trip. Seoul is the seat of the present Japanese government of Chosen, as Korea is called by its natives, and before any non-resident foreigner can go into the interior, permission must be obtained from the Bureau of Foreign Affairs. This permission is usually freely given but is a formality rigorously enforced, for the Japanese insist upon knowing the "reason why" for the visits of all foreigners to the remote parts of their newly acquired possession.

The Museum's expedition was given the enthusiastic support of the government and I was furnished with one of their official interpreters, a Japanese who spoke Korean, Chinese and a little English. In Seoul a Korean cook who knew some English was engaged and became a valuable assistant.

We went by ship from Fusan to Chon Chin, called by the Japanese Seshin, an uninteresting little village of a few hundred inhabitants not far from the Russian city of Vladivostok. From Seshin we struck directly into the interior, the first stage of our journey being over an interesting little railroad up which we were pushed on small hand cars.

We spent the night at the old walled town of Puryon and next day left the railway at Muryantai traveling by bull-carts to Musan forty miles away. Musan, situated close to the Tumen River, is the largest town in northeastern Korea and is full of interest. It is typical of the old Korean cities having heavy walls and massive gates for its protection in the continual warfare which was waged in the early days between the Koreans of the north and invaders from China. During the Russo-Japanese war a few white men visited Musan, but the country beyond it was unknown to the western world.

Our objective was the little village of Nonsatong lying just at the edge of the great forests which stretch away to the west and south toward the Paik-tu-san. At Musan we had the greatest difficulty in securing horses for the trip into the wilderness. Absurd stories that wandering bands of Chinese robbers ranged along the borders of the forest had been rife since we left the coast, and had the Japanese gendarmes not ordered the Koreans to go we should not have been able to secure the necessary transportation for our food and equipment.

Until we reached Nonsatong, the country was a great disappointment; it was a succession of bare, treeless hills much like those of southern Korea



except for the fact that there were no terraced rice paddys as in the south, but when we came to the straggling line of huts which marked the last point of civilization, we could see in the distance the great mass of larch trees rising tier above tier on the mountain slopes until they were lost in the low-hanging clouds.

The inhabitants of Nonsatong had never seen a white man and to them I was an object of the greatest curiosity. They are timid, peace-loving, resistless people, lazy but hospitable and good-natured. The interpreter told them that I would pay six *sen* (three cents) for any small mammals which they could catch. They did not believe at first that any man would



The expedition traveled by bull-cart from Muryantai to Musan

be foolish enough to pay such a price as that for something which could not be eaten, but after repeated urgings to try and see, on the second day the men of the village arrived en masse with a chipmunk. At once six *sen* was offered for it to the utter amazement of the Koreans. The next day there was an influx of chipmunks, for every man and child in the village turned out to catch them and by two in the afternoon they had nineteen. We spent ten days with them collecting birds and mammals and then started westward toward the Paik-tu-san. I did not care to climb the mountain itself, but wished to travel through the unexplored country to its base. Our route was along the Tumen River and the first fourteen miles was easy traveling, for there was an old half-obliterated trail which led to a deserted log cabin once used by hunters; this was the last habitation of any sort in



The valley up which we traveled on the way to Musan. This valley is cultivated and fields of oats and millet are found along the watercourse



On the right are the cliffs of China and on the left are those of Korea, the Tumen River at this point forming the boundary between Manchuria and Korea



The expedition crossing a burned tract on the way to the Samcheyong



The Samcheyong. Looking across the largest lake toward the island in its centre



The raft on which the Museum's expedition traveled some 350 miles of the way down the Yalu River

the wilderness. The collecting was not good at this log camp, and after a few days we continued deeper into the forest. The traveling was difficult, for as we ascended the plateaus the larch forest became so thick that at times we had to cut our way through the tangled branches. We followed the lines of least resistance twisting and turning to avoid impassable barriers and going entirely by compass. The Korean horsemen and in fact all the party came under the influence of the gloom and silence and it was difficult to force them to proceed.

After reaching the base of the Paik-tu-san we retraced our steps and struck southwestward across the watershed to the Tumen valley. I had learned from the Koreans that somewhere in the forests was located the Samcheyong, "Three Bodies of Water." So far as I was aware, Korea was a lakeless country and the Samcheyong seemed well worthy of investigation. We reached the lakes, as they proved to be, after a difficult march through the forest and found that there really were three bodies of water lying on the summit of the watershed which separates the region drained by the Tumen River from that drained by the Yalu River and its tributaries. The basins of the lakes are composed entirely of loose volcanic ash which probably came from some violent eruption of the Paik-tu-san many years ago. Upon returning to Seoul I found that the lakes were indicated upon a military map made during the Russian war, but that nothing more than the fact of their existence was known; they



The open larch forest near the log cabin in the wilderness where we camped. The forest became continually more dense as we proceeded



Mr. Andrews eating with Koreans at Nonsatong. These men had been making an offering to the god of the valley which was supposed to live in the rock and tree that stand near together at the right in the picture

had probably been located by information obtained from the Koreans or from some ancient Chinese map.

After leaving the Samcheyong we continued through the forests across the watershed and eventually reached the Yalu where at the little town of Shinkarbachin, a raft was secured to take us down the river. We floated



Korean praying at a shrine just at the edge of the woods on the Yalu River side. Each one of the horsemen thanked the god of the mountain for his safe passage through the woods



as much as seventy miles a day in the upper reaches of the Yalu and landed at the Chinese city of Antung on the west coast, where connections were made for Seoul by train. We had traveled entirely across northern Korea.

Although the specimens secured upon this trip have not yet reached the Museum, the zoölogical results of the expedition cannot but be of considerable importance. The mammals of Korea are especially interesting in relation to the problems of the Japanese insular fauna and its origin, and specimens from the northern part of the peninsula will be of great importance in this study. Since the region had never been visited by a zoölogist it will undoubtedly be found that a large percentage of the small mammals are new to science. The birds, of which a considerable number were secured, will in many cases probably prove to be of the same species as those of northern Europe, for although thousands of miles away they are still in the same life zone which stretches entirely across the continents of Europe and Asia.

It was interesting to find that the dense forests were practically without birds or mammals — at least during the time in which I visited them. Three species of small rodents were the only mammals which could be trapped, and birds were almost totally absent. Later in the year during the hot months of summer, the Koreans told me that bear, deer and a large stag were sometimes found near the Paik-tu-san, but that they did not go into the woods until the grass was long and the pasturage good.

As collecting was conducted across the watershed from the Tumen River region into that of the Yalu a very good representation of the fauna of this hitherto unknown section of Korea was secured for the Museum.



Korean gun-bearer picking azaleas. These flowers cover the mountain slopes about the first of June

## MUSEUM NOTES

SINCE the last issue of the JOURNAL the following persons have been elected to membership in the Museum:

*Patron*, MRS. WILLIAM H. BLISS;

*Life Members*, MRS. SAMUEL W. BRIDGHAM, MESSRS. ROBERT STERLING CLARK, ADAM W. S. COCHRANE, R. D. O. JOHNSON, ALFRED J. KLEIN, BENJAMIN STRONG, JR., FREDERICK TAYLOR and J. WATSON WEBB;

*Sustaining Members*, MRS. JOHN D. ARCHBOLD, MRS. SARA HERMANN, MRS. L. H. LAPHAM, and MISS MARY GARNER TILNEY;

*Annual Members*, MRS. SIDNEY C. BORG, MRS. ARTHUR D. BRANDEIS, MRS. JOHN C. BRECKINRIDGE, MRS. FRANCES I. CAPEN, MRS. CARROLL DUNHAM, MRS. J. CLIFTON EDGAR, MRS. GEORGE S. EDGELL, MRS. FRANKLIN FARREL, MRS. GEORGE A. HELME, MRS. ADOLPH LEWISOHN, MRS. HENRY K. POMROY, MRS. A. SUMNER ROSE, MRS. GRANT SQUIRES, MRS. FLORENCE M. STOWELL, MRS. LEWIS S. WOLFF, MRS. JOHN ALVIN YOUNG, MISS JUSTINE V. R. BARBER, MISS EMILY CROSS, MISS EMMA FEUCHTWANGER, MISS RUTH B. FISHER, MISS CLARA FRIEDLANDER, MISS CATHERINE MURRAY, MISS MARIE F. C. STOCKMANN, DR. PHINEAS HILLHOUSE ADAMS, DR. F. R. OASTLER and DR. HOWARD C. TAYLOR, and MESSRS. GORDON AUCHINCLOSS, LOUIS H. BARKER, ALEXANDER M. BING, JAMES ELLIS BRIGGS, ALGERNON T. BURR, IRVING L. ERNST, ZOHETH S. FREEMAN, C. A. GRASSELLI, EUGENE D. HAWKINS, ALFRED M. HEINSHEIMER, RANKIN JOHNSON, ARTHUR KAUFMANN, L. D. KELLOGG, GEORGE H. LEVY, WILLIS E. LOUGEE, DAVID W. McNAUGHER, DAVID B. SIMPSON, JESSE M. SMITH and SIMON WEILLER.

THE THIRD ANNUAL TEACHERS' DAY will be held at the Museum on Saturday, November 16. The program will include addresses by President Henry Fairfield Osborn and Superintendent William H. Maxwell and an illustrated lecture by the Arctic explorer, Vilhjálmur Stefánsson, just returned from four years' work in the far north.

It is through its permanent exhibits that the Museum is most useful to teachers. For example, its Indian and Eskimo halls teach the life and culture of these people to-day and in the past very fully. Few realize however, as they pass in review a long series of cases containing clothing, weapons or pottery with stories of their history and use, what work has been done, perhaps through many years, what money spent and sacrifices made to bring such collections to New York from the primitive race which used them. It is this exploration work of the Museum as preparation for the institution's usefulness to teachers that will be the theme of this Third Annual Teachers' Day. Fortunately there have arrived at the Museum some of the collections gathered by Mr. Stefánsson some four thousand

miles distant among the uncivilized Eskimo which he has discovered in the Coronation Gulf region of Arctic America. These collections have been placed on exhibition and will be open for inspection at the close of Mr. Stefánsson's lecture.

THE MORGAN COLLECTION of gems and gem material has received a recent addition of some superb mineral material. The most conspicuous of the specimens perhaps are the two crystals of kunzite (lilac-colored spodumene), seven and ten inches long respectively. After them in interest are three large rubellite (tourmaline) crystals. The deep gerardia tone of these is in one instance heightened by a partial immersion in the side of a gray translucent quartz. There are also a green tourmaline with pink nucleus in a heavy quartz block from Rumford, Maine, a shell of amethyst from the famous Brazilian grottoes, a large topaz pebble clouded on its surface by minute abrasions, a "water-bottle" (enhydros) from Salto, Uruguay, a mound of crystals of epidote from Alaska and three groups of the unrivaled Brazilian phenacite.

Besides the above, the gift includes also a quartz sphere, a quartz slab infiltrated with gold, one exquisite fresh water pearl and a valve of the pearl oyster (*Meleagrina margaritifera*). The last from Thursday Island is of most lustrous quality and bears an attached pearl.

PRESIDENT HENRY FAIRFIELD OSBORN and DR. J. A. ALLEN will represent the Museum at the Ninth International Congress of Zoölogy to be held at Monaco in March 1913.

AN interesting specimen recently presented to the Museum is the skull of a walrus dredged from the bottom of Penobscot Bay, Maine. The donor, Mr. Langdon Gibson, has supplied the following record of its discovery. "It was found by Sidney Norton in his scallop dredge in December, 1911, in fifty fathoms of water, two miles to the southwest of Andrews Island, off Owl's Head, Penobscot Bay." The skull agrees fairly well with that of the Atlantic walrus, *Trichechus rosmarus*. One of the tusks is complete, the other lost, and the occiput and zygomatic arches are missing. The bone is in fairly good preservation and quite well petrified, indicating that the specimen is not at all recent; it must be thousands of years old to have attained this degree of petrification under ordinary circumstances.

The especial interest of this skull is that it shows the more southerly range of the walrus in former times, probably during the Glacial Epoch. At the present time the southern limit of range of the walrus is the Labrador coast. Fossil remains of walruses have been found along the Atlantic coast as far south as South Carolina, but it is doubtful whether they all belong to the modern species.

THE endowment fund of the Museum has recently received an addition of five thousand dollars from Mrs. William H. Bliss. Mrs. Bliss has been elected a patron of the Museum in recognition of her gift.

THE ANNUAL MEETING OF THE NATIONAL ASSOCIATION OF AUDUBON SOCIETIES was held in the east assembly room of the Museum on Tuesday, October 29, 1912. The report of the secretary and executive officer of the society, Mr. T. Gilbert Pearson, showed that the association had had the most successful year in its history. With an income of approximately sixty thousand dollars, new protective laws had been secured and existing ones enforced; wardens had been maintained on the fifty-odd bird reservations which have been established largely through the efforts of the association, and twenty-eight thousand school children had received systematic instruction in bird study.

At the afternoon session, the association was addressed by Mrs. Alice Hall Walter of Providence, Rhode Island, and by Mr. Gustave Straubenmüller, associate superintendent of schools of the Board of Education of New York City, on the educational value of nature study.

At four o'clock a public address was given in the large lecture hall by Professor Homer Dill of the University of Iowa, on the birds of Laysan Island in the Hawaiian Reservation. Shortly preceding Professor Dill's visit to this island, the United States government had arrested twenty-three Japanese poachers who were living on the island while slaughtering its birds to preserve their plumage for millinery purposes. It is estimated that no less than three hundred thousand albatrosses, terns, and other sea birds were thus destroyed, and Professor Dill found abundant evidence of the results of this destruction in acres of bleaching bones and thousands of wings which were in process of preservation at the time the poachers were apprehended by the United States revenue cutter "Thetis." Professor Dill learned that the poachers cut the wings from living birds which were left to bleed to death, while other birds, which were too fat to be readily prepared, were thrown into cisterns slowly to starve and thus reach a condition in which their plumage could be more readily preserved.

At the meeting of the Executive Committee on October 16, the following persons were elected life members of the Museum in recognition of their interest in the institution: Messrs. Alfred J. Klein, R. D. O. Johnson, Benjamin Strong, Jr., and Frederick Taylor.

HENRY FAIRFIELD OSBORN, as President of the American Museum of Natural History, has been appointed a trustee in perpetuity of the Kahn Foundation for the Foreign Travel of American Teachers.

DR. J. G. KNOWLTON has presented to the Museum a few skulls and other specimens from the Eskimo of North Baffin Land. Among the latter are a

lot of miniature weapons, tools, etcetera, for the most part carved of wood, which Dr. Knowlton reports were found in a small cache at a grave. The objects were covered by a small heap of stones placed at the front of the corpse and were no doubt made that "their respective souls might accompany and serve the deceased in the future land."

AMONG the visitors to the Museum during the autumn was Dr. Carlos de la Torre, professor of geology in the University of Havana and one of the most distinguished Cuban scientists. Dr. La Torre is known not only as a naturalist of high repute, but also as an influential leader in the prolonged struggle which culminated in the independence of Cuba, and as a former mayor of Havana. He has brought to the Museum for study and comparison a remarkable collection of fossils more fully noticed elsewhere.

MR. JULIAN S. HUXLEY, a grandson of the great English scientist, visited the American Museum early in October on his way to Houston, Texas, to take part in the inaugural ceremonies of the Rice Institute. He will be a member of the scientific faculty of the Institute, his duties commencing with the year 1913.

At the meeting of the Executive Committee on October 16, Mr. Alanson Skinner was appointed assistant curator in the department of anthropology.

THROUGH the kindness of Dr. Aleš Hrdlička of the United States National Museum, the department of anthropology has received casts of all the large fragments of the famous Neanderthal man discovered near Düsseldorf on the Rhine in the spring of 1857. This skeleton must ever be renowned as the first positive evidence of a new and very ancient type of man. Since that date more complete and better preserved examples have come to light so that many European museums now possess real skeletons of this type.

THE MUSEUM has received from Mr. D. C. Stapleton the gift of valuable prehistoric objects in gold and platinum from the Province of Esmeraldas, Ecuador, and the head-waters of the San Juan River, Colombia, and has placed the collection on exhibition in the South American gallery on the third floor. The objects show examples of casting and beating, of plating where copper has been covered with thin gold, of the union of two pieces of gold by welding and of the soldering of two minute surfaces in such manner that it is difficult to detect the solder. The objects in platinum are of most interest, as it is not known that this metal was ever worked, except in this locality, by a prehistoric people.

MR. RODMAN WANAMAKER has presented to the Museum the valuable collection of photographs made on the Rodman Wanamaker historical



expeditions for the study of the North American Indian in 1908-1909. The opening of the exhibition of these pictures on the evening of October 24 in the west assembly hall, was made the occasion of a reception given by the president and trustees of the Museum conjointly with the American Scenic and Historic Preservation Society. After the reception a lecture was given in the auditorium of the Museum by Dr. Joseph K. Dixon with colored slides and moving pictures illustrating the "Last Great Indian Council." The striking music accompanying the motion pictures was composed by Dr. Irvin J. Morgan, who used the phonographic records made during the Wanamaker expeditions as his source of Indian rhythms and themes. The JOURNAL hopes to reproduce in a later issue a series selected from the Wanamaker photographs presented to the Museum.

DR. R. M. ANDERSON of the Stefánsson-Anderson Arctic expedition, arrived in San Francisco November 2 on the steam whaler "Belvedere," the guest of Captain and Mrs. Cottle. The "Belvedere" picked up Dr. Anderson and the sixty cases of the expedition's collections at Baillie Island (Cape Bathurst), July 28 and carried them on a four months' whaling cruise, during which Dr. Anderson had the opportunity of seeing the capture of twelve specimens of the huge bowhead whale.

DR. ALEXIS CARREL, the recipient of the Nobel prize for research in medicine for 1912, lectured at the Museum November 11, under the auspices of the New York Academy of Sciences and the American Museum of Natural History. The subject of Dr. Carrel's lecture was "The Results of the Suture of Blood Vessels and the Transplantation of Organs."

ONE of the smaller archaeological collections secured by Mr. Stefánsson is from Point Hope. This has now been catalogued. Among other things it contains a fine series of worked bone and ivory illustrating the methods and processes formerly used by the Eskimo. The ends of a piece of ivory were cut off by drilling holes in toward the middle, until the piece could be broken asunder; long slender pieces were cut off by grooves from opposite sides, and so on. A large series of chipped points and many ground slate knives accompany the ivory and bone objects.

AMONG interesting recent accessions to the department of geology, mention may be made of a particularly good slab of Tennessee marble showing sections of characteristic fossils and a large block of quartzite from Luverne County, Minnesota, with a highly polished surface produced by wind-blown sand. The department is in possession also of the most recent model of the Isthmus of Panama, showing the canal in its completed form.